

New Year

SEASON 2021/2022 – THIRD ROUND



With the beginning of the New Year 2022, Tsvety, as well as you, needs to solve the following problem:

You are given a weighted graph with N vertices and M undirected edges. You have to choose K of these vertices to be “houses” and then choose for each of the N vertices one house. You are also given a second graph with N vertices and L directed edges. Your program is expected to minimize the sum of the weights on the edges on the path $p_1 \rightarrow home_{p_1} \rightarrow p_2 \rightarrow home_{p_2} \rightarrow \dots \rightarrow p_t \rightarrow home_{p_t}$ ($t \geq 2$), where $a \rightarrow b$ denotes the shortest path (with the least sum of weights) from vertex a to vertex b , where $home_{p_i}$ is the “house” of vertex p_i .

Each of the edges in the second graph has a weight w , which is a rational number between 0 and 1, so that the outgoing edges from every vertex have a total sum of their weights = 1. Your solution will be evaluated in the following way for every test case:

- A random path p in the second graph is chosen, such that it starts at vertex 1 and every next vertex is chosen with probability equal to the weight of the corresponding outgoing edge. The length of the path p is not specified.
- The vertices from this path p correspond to the vertices from the first graph. The associated path in the first graph with the houses in between is constructed and traversed. The minimum sum of weights on that path is calculated.
- The steps above repeat a number of times.
- The mean-average of all these sums is the value of *yourScore* for the corresponding test.

Input

On the first row of the input file `newyear.in` there are four natural numbers N , M , L , and K . On the next M rows there are 3 natural numbers for each – the endpoints of an edge from the first graph and its weight a_i . On the next L rows there are 2 natural numbers, followed by a rational number between 0 and 1 – the endpoints of an edge from the second graph and its weight respectively.

Output

On the first row of the output file `newyear.out` print K natural numbers – the numbers of the houses. The order doesn't matter and the numbers of the houses need to be different. On the second row output N natural numbers - $home_1, home_2, home_3, \dots, home_N$.

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Grading

For each test $minScore$ is the lowest score among the scores of all contestants, and $yourScore$ is your score. You will receive $(\frac{minScore+1}{yourScore+1})^2$ multiplied by the number of points allocated for that test.

Restrictions

$$1 < N \leq 5 \times 10^3$$

$$1 \leq M, L \leq 2 \times 10^4$$

$$1 \leq K \leq \min(N, 200)$$

$$1 \leq a_i \leq 10^6$$

Time limit: 5 sec.

Memory limit: 256 MB.

Tests distribution

Percentage of tests	Constraints
30%	$N \leq 20$
30%	$N \leq 500$
40%	$N \leq 5 \times 10^3$

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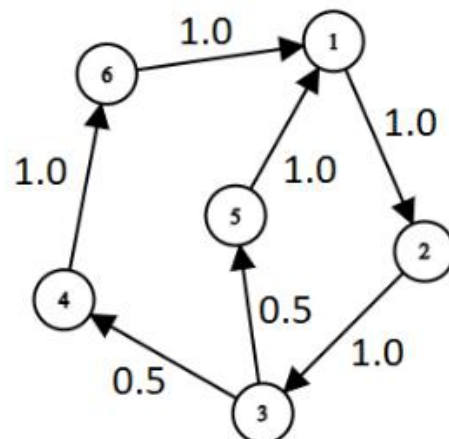
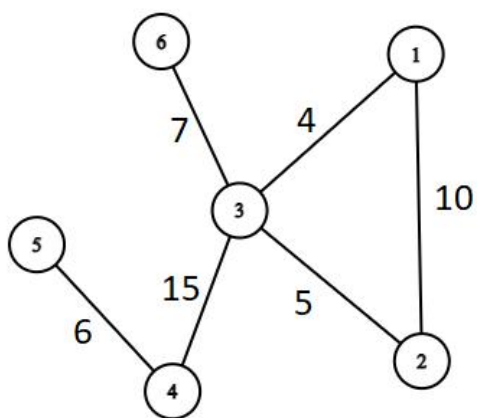
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Example test case

Input (newyear.in)	Output (newyear.out)
6 6 7 3	1 3 4
1 2 10	1 1 3 4 4 1
2 3 5	
1 3 4	
3 4 15	
4 5 6	
3 6 7	
1 2 1.0	
2 3 1.0	
3 4 0.5	
3 5 0.5	
4 6 1.0	
6 1 1.0	
5 1 1.0	

Explanation of the example test case



The houses will be 1, 3 и 4, and the array home = [1, 1, 3, 4, 4, 1].

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Let there be a random path p in the second graph: $1 \rightarrow 2 \rightarrow 3 \rightarrow 5 \rightarrow 1$. As a result your solution will traverse the following path in the first graph: $1 \rightarrow 1 \rightarrow 2 \rightarrow 1 \rightarrow 3 \rightarrow 3 \rightarrow 5 \rightarrow 4 \rightarrow 1 \rightarrow 1$. The total weight on that path = $0 + 10 + 10 + 4 + 0 + 21 + 6 + 19 + 0 = 70$.